

## **REMARKS/ARGUMENTS**

Claim 13 has been objected to because there is no antecedent basis for "the injector combustor". Claim 13 has been amended to be dependent on claim 10 as questioned by the examiner.

The examiner has renumbered claims 30 through 37 to be claims 28 through 35. Amendments have been made for the claims to have proper references in the case of dependent claims.

Claim 15 has been rejected under 35 USC 112, first paragraph, for failure to comply with the enablement requirement. The examiner has stated that it is unclear what type of gas source and what structure makes up a "ducted rocket hot gaseous source". Applicant believes that the description of a ducted rocket hot gaseous source refers to a solid rocket or hybrid rocket motor such as is commonly used in the industry for surface to air missiles. As this is the original claim language it is believed further disclosure of the term is not necessary in the specification.

Claim 1 through 37 have been rejected under 35 USC 112, second paragraph, as being indefinite because in claims 1 and 20 the injector nozzles are said to be "offset radially at an angle away from and toward the engine longitudinal axis". The examiner further states that as disclosed the nozzles are either offset towards or away from the longitudinal axis, but not towards and away from.

The disclosure in the specification paragraph [0035] in the last two sentences provides an example of injector exhaust nozzles 53 offset from the engine longitudinal flow axis in an alternating pattern wherein adjacent injector exhaust nozzles 53 may be offset from parallel away and towards the axis. Other patterns may be used as well, as for example, on the struts 52 the injector exhaust nozzles 53 may alternate one to the other wherein they are offset away from the engine longitudinal flow axis; however, they do not direct injector gasses in the same direction.

Claim 8 and 26 have been rejected under 35 USC 112, second paragraph, because the examiner has found phrase "varying functioning opening relative the radial distance" to be unclear.

The ejector exhaust nozzles 53 may not have uniform opening dimensions. As an example, as injector exhaust nozzles 53 may be formed in a plurality of ejector rings, ring segments or struts, as the injector exhaust nozzles 53 may be located further away from the longitudinal axis one relative to another, the injector exhaust nozzles 53 may have larger openings to exhaust more fluid flow to achieve a uniform fuel distribution near the wall of the engine. Other techniques may be used to achieve uniform fuel distribution if that may be the desired operational mode.

Claim 13 has been rejected under 35 USC 112, second paragraph, because it is unclear what flow streams are being referred to in the phrase "a subsonic and supersonic flow stream". Also, the examiner has state "ramjet gaseous fuel" is unclear as to what fuels are defined.

The engine flow stream as referenced in Figure 1 and paragraph [0035], page 7, is the flow stream around which the engine major elements are structured. Claim 13 refers to use of scramjet gaseous fuel through the injector assembly in that flow stream whether subsonic or supersonic. As understood in the art, a scramjet fuel may typically be gaseous and volatile to aid in quick reaction with for example air to facilitate fast combustion for nearly complete combustion prior to a flow exiting the engine.

Claims 20, 21, 26 and 27 have been rejected under 35 USC 102(b) as being anticipated by Boehnlein, et al. The examiner has stated that the 5,946,904 patent ('904) discloses an injector assembly for a ramjet having plural exhaust nozzles 39 defined in an injector assembly 18 and the exhaust nozzles directing fluid in partially offset stream which alternate away from and towards the longitudinal axis. It is further stated that Figure 7 clearly shows rings and strut support elements.

Claim 21 has been canceled.

Claim 20 has been canceled and the limitations included with claims 22, 23 and 24 that have been found allowable.

Claim 26 as amended to properly designate injector exhaust nozzles 53 as disclosed in the specification, this was a clerical error, claims a varying function opening relative to the radial distance from the longitudinal axis. There is no such disclosure in the '904 patent. Therefore, by adding the

limitations of claim 20 with claim 26, claim 26 should be allowed.

Claim 27 has been canceled.

Claims 1, 3, 9 through 14 and 16 have been rejected under 35 USC 103(a) as being unpatentable over Boehnlein et al. ('904) in view of Bichler et al. The examiner has stated that the '904 patent discloses the invention substantially as claimed. It is further stated that the '904 patent further discloses external and internal gas supply systems and an injector combustor 15 which uses the same fuels discussed in the instant application. The '904 patent does not disclose a variable inlet system attached to the mixer whereas the examiner states Bichler et al. disclose a variable area inlet controlled by actuators. The examiner indicates that at the time of the invention it would have been obvious to include a variable area inlet nozzle as disclosed in the ramjet of Bichler et al.

Bichler's disclosed inlet is not designed for the ejector ramjet engine disclosed in the instant application, nor does it anticipate such a use. The Bichler design provides what may be basically dead air to a ramjet at speeds below Mach 3.5. Below Mach 3.5 the ramjet portion of Bichler's disclosed inlet captures only relatively low energy boundary layer flow and then subjects the flow to travel through boxes with multiple struts, each of which may generate significant drag. The result may be air that is not suitable for generating propulsive thrust in a ramjet. Instead the Bichler art suggests at column 4, line 34 that at subsonic speeds the "access to the ramjet inlet 20 through the box shaped inlet 10 is free for bleed of the boundary layer air." In addition, Bichler states at column 3, line 48 that the struts may create "only a small resistance to the airflow", it has been found by analysis that if the struts may be implemented as round tension elements as depicted in Bichler Figure 26, each strut may create an internal drag equivalent to the external drag created by the remainder of the entire aircraft. Bichler relies upon the turbojet for thrust and thus merely dumps the low energy boundary layer overboard. Bichler does not disclose or anticipate a variable area inlet suitable for an ejector ramjet engine over the speed range of interest. For all of these reasons it is believed the instant invention is not disclosed or anticipated in the cited art and claim 1 should be allowed.

Claim 3 is dependent on what is believed to be an allowable base claim and therefore should

be allowed.

Claim 9 is dependent on what is believed to be an allowable base claim and therefore should be allowed.

Claim 10 is dependent on what is believed to be an allowable base claim and therefore should be allowed.

Claim 11 is dependent on what is believed to be an allowable base claim and therefore should be allowed.

Claim 12 is dependent on what is believed to be an allowable base claim and therefore should be allowed.

Claim 13 claims use of scramjet gaseous fuel. This is not directly disclosed in the "904 patent. Therefore this claim should be allowed. Alternatively, the claim is dependent on what is believed to be an allowable base claim and therefore should be allowed.

Claim 14 is dependent on what is believed to be an allowable base claim and therefore should be allowed.

Claim 16 has been rejected as the examiner has stated that Boehnlein et al. also discloses in column 1, lines 31 through 34 operation as set forth in claim 16. However, the reference to the "904 patent discloses injection of excess oxidizer. Claim 16 in the instant application claims increasing fluid flow to the injector assembly as well as using a nominal lean fuel to air ratio. Therefore, claim 16 should be allowable.

Claim 7 has been rejected under 35 USC 103(a) as being unpatentable over Boehnlein in view of Bichler et al. as applied to claims 1 and further in view of Pearce. The examiner states that Boehnlein et al. in view of Bichler does not disclose that the injector rings have slidable connections. However, the examiner states that Pearce et al. discloses a combustor fuel pipe arrangement with slideable connections. The examiner indicates at the time of the invention it would be obvious to combine these three patents.

The Pearce art introduces junction boxes 43 that may have slideable connections that are

sealed by O-rings 41 or the like. These fuel line junction boxes are positioned external to the outer wall 12 rather than in the fluid flow path as in the instant invention. The O-rings are suggested by Pearce to minimize leakage. The instant invention slip joint is disposed in the engine flow stream. Pearce does not disclose nor anticipate a slip joint in an engine flow stream wherein completely different parameters are involved. In the Pearce case the issue, as was painfully discovered in the Challenger Incident wherein rubber O-rings on slip joints were designed to contain propellants that are exposed to high pressure and temperatures, of susceptibility to failure is quite real. It is believed Pearce does not disclose or anticipate the application in the instant invention and therefore claim 7 should be allowed.

Claim 25 has been rejected under 35 USC 103(a) as being unpatentable over Boehnlein et al. in view of Bichler et al. as applied to claim 20 above, and further in view of Pearce. Claim 25 has been amended to include the limitations of claims 20 and 21. For the reason given regarding claim 7 above it is believed claim 25 as amended should now be allowable.

Claim 17 has been rejected under 35 USC 103(a) as being unpatentable over Boehnlein et al. in view of Bichler et al. as applied to claim 1 above, and further in view of Kretschner. The examiner has stated that Boehnlein et al. in view of Bichler et al. disclose the invention substantially as claimed, but that Boehnlein et al. in view of Bichler et al. do not disclose injecting fluid into the nozzle divergent portion to control the separation point of the flow. The examiner further states that Kretschner discloses a hypersonic engine with a variable exhaust nozzle configuration 44 and gas injection 64 to control the location of separation 54.

Kretschner discloses optimization of the performance of the nozzle based on adjusting the area of the exit nozzle in a mechanical manner. There is no mention of injection of fluid into the exit nozzle to separate the exhaust gas and thus prevent over expansion of the exhaust gas flow. The Kretschner disclosure rather expels fluid, air, into the wake zone of the engine. This is the illustration on Figures 2 and 3. The fluid is not injected into the exit nozzle to separate the exhaust hot gas flow from the nozzle wall. If fluid were injected into the exit nozzle, for example through the nozzle wall at a

selected location, the exhaust gas flow may be tripped and separated from the nozzle wall, creating a separation bubble of ambient pressure air against the aft facing nozzle surface. This may reduce drag forces on the nozzle. Kretschner does not disclose nor anticipate such a configuration. Claim 17 should be allowed.

Claim 18 (miss numbered 17) has been rejected under 35 USC 103(a) as discussed by the examiner regarding Boehnlein et al. in view of Bichler et al except that they do not disclose injecting fluid into the nozzle divergent portion during supersonic operation to control the thrust vector. The examiner has stated that Hausmann discloses a means for injecting fluid (20, 24) in order to control the thrust vector during supersonic operation.

The Hausmann disclosure describes a method and structure for switching flow from one duct 18 to a second duct 20. The direction of the exhaust gas exit is then controlled by the physical structure of the valve to determine the thrust vector rather than the introduction of a fluid into the exit nozzle exhaust flow to modify the location of the thrust vector. The Hausmann disclosure uses control nozzles to switch between gas flow ducts and does not inject fluid into the exit nozzles 22 and 24 to modify the location of the thrust vector. This does not disclose nor anticipate the disclosure and claim of the instant invention. Claim 18 should be allowed.

Claim 1 has been corrected in line 10 after "the injector" by inserting the word "exhaust" to agree with the original specification and claim nomenclature. There is no injector nozzle.

Claim 8 has been corrected in line 1 after "wherein the" by inserting the word "injector" to agree with the original specification and claim 1 nomenclature.

It is believed with the clarifying amendments that the uniqueness of the instant invention is not disclosed in the cited art. There has been a long felt need for a solution to this problem.

Accordingly it is believed that the rejections under 35 USC Section 102(b), 103(a) and 112 have been overcome by canceling and amending of the claims and the remarks, and withdrawal thereof is respectfully requested.

In view of the above, it is submitted that the claims are in condition for allowance.

Reconsideration of the cause for rejections and objections is requested. Allowance of claims 1 through 19, 22 through 26, and 28 through 35 is earnestly solicited.

An additional fee of \$172.00 is enclosed for 4 additional independent claims in excess of 3.

If you have any questions do not hesitate to contact me.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Dennis W. Beech', with a stylized flourish at the end.

DENNIS W. BEECH  
Reg. No.: 35,443

DWB/ab



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In regards to application of:

Serial Number: 10/081,343  
Applicant: BOEHNLEIN, JOHN et al.  
Filing Date: 02-20-2002  
Title: EJECTOR BASED ENGINES  
TC/AU: 3746  
Examiner: FREAY, CHARLES GRANT

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~~17~~ page of response  
A check in the amount of \$172.00

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